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## COMPLETE SPECIFICATION

## Improved Baling Machine

We, ALLIS-CHALMERS MANUFACTURING COMPANY, a corporation organised under the laws of the State of Delaware, United States of America, of 1126, South 70th Street, West Allis 14, Wisconsin, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to baling machines and is concerned, in particular, with baling machines of the type in which a supply mechanism for delivering material to a bale forming mechanism is operable to gather material and continuously feed it to a delivery outlet from which the material is intermittently passed to the bale forming mechanism in accordance with a predetermined operating cycle thereof.

Hay baling machines for use on farms are usually equipped with a supply mechanism including a pickup and feed mechanism, which gathers windrowed hay and feeds it rearwardly of the machine as the machine is advanced in the field, and with a processing or bale forming mechanism, which is supplied with hay by the feed mechanism, and which comprises mechanism for forming the picked-up hay into a compact bale, wrapping the formed bale with twine, and ejecting the wrapped bale from the machine.

In some baling machines of conventional construction, as for instance in the rotary type of machine which rolls a mat of material into a round bale, the bale forming and wrapping operations are performed consecutively. That is, the machine operates, in accordance with a predetermined cycle of operations, first performing a material compacting operation, then a bale wrapping operation and finally a bale ejecting operation. Depending on the length of time which is required to perform the bale wrapping and ejecting operations, a more or less extended time interval occurs between the moment when the machine has finished compacting the material for one bale and before it starts compacting material for the next bale. This time interval during which no material is being compacted by the machine presents a problem because the feed of material into the bale forming mechanism must be stopped for the length of said interval.

The usual practice adopted, for stopping the feed of material into the bale forming mechanism of rotary balers during the bale wrapping and ejecting phases of the operating cycle, is to stop the advancing movement of the machine in the field for the length of time which is required to perform the bale wrapping and ejecting operations, and during that length of time to stop, also the operation of the pick-up and feed mechanism.

Attempts have previously been made to eliminate the necessity of such periodic stops of the machine in the field, in this connection, it has been proposed, for instance, to provide a rotary baling machine in which the bale forming or processing mechanism is divided into bale rolling and compacting and bale wrapping mechanism, each disposed in a different part of the machine whereby the bale is rolled and compacted in one part of the machine and wrapped in another. In such a case, when a bale has been formed of the desired diameter in the rolling and compacting mechanism, the bale is transferred quickly from the bale rolling mechanism to the separate bale wrapping mechanism which is arranged on the machine to the rear of the bale rolling mechanism. The time interval during which the feed of material to the bale forming mechanism of such a machine must be stopped is determined by the length of

time which is required to transfer the bale from the bale rolling to the bale wrapping mechanism of the machine. Since this time can be kept very short it was proposed to advance the machine continuously in the field and to also operate the pickup and feed mechanism continuously, but periodically to block the passage of material into the bale forming mechanism just long enough to permit transfer of a rolled bale into the wrapping mechanism.

For satisfactory operation of a hay baling machine it is desirable that the pickup and feed mechanism is capable of handling a substantial volume of material at a reasonable ground speed of the machine. Under these conditions, temporary blocking of the material so that it will pile up in the feed mechanism, usually an endless conveyor, for even a very brief period of time has been found to be impractical because the pile up of material is apt to plug the machine. Also the provision of separate bale rolling and compacting and bale wrapping mechanisms, as heretofore proposed entails relatively high additional manufacturing costs.

It is an object of the present invention to provide an improved baling machine which overcomes the disadvantages of the prior art in a satisfactory manner, which will gather material continuously but feed it intermittently to a bale forming mechanism without causing plugging of the machine under relatively heavy feeding conditions, and which is of relatively simple construction, efficient and reliable in operation, and which may be manufactured at relatively low cost.

According to the invention, a baling machine of the type in which a supply mechanism for delivering material to a bale forming mechanism includes a continuously operable feed mechanism for feeding material from an inlet to a delivery outlet from which the material is intermittently passed to the bale forming mechanism which has a predetermined operating cycle including a material admitting phase, during which material is passed from the delivery outlet to the bale forming mechanism, and a material cut-off phase, during which passage of material to the bale forming mechanism is cut-off, is characterised by the provision of transfer means disposed at the delivery outlet of the feed mechanism and automatically selectively adjustable either to a first operating condition for passing material from the delivery outlet to the bale forming mechanism, during the material admitting phase, or to a second operating condition for causing material to return from the delivery outlet to the feed mechanism inlet, during the cut-off phase.

Preferably the transfer means comprises an endless conveyor pivotally mounted adjacent the delivery outlet of the feed mechanism for swinging movement between a lowered first operating position and a raised second operating position.

Return conveyor means may be provided for receiving material from the transfer means when the latter is in the second operating position, and delivering said material back to the feed mechanism inlet.

Other features, which may be included in accordance with the invention, will hereinafter be described and will be referred to in the appended claims.

The invention is illustrated, by way of example, in the accompanying diagrammatic drawings, in which the terms right and left are used as applied when looking forwardly from behind the machine. In the drawings:—

Fig. 1 is a left side elevation of a continuously operable rotary baling machine, portions of the machine being broken away to show the mechanism beyond, and a left ground wheel being omitted and its supporting axle shown in section;

Fig. 2 is a plan of the machine shown in Fig. 1, with some parts broken away;

Fig. 3 is an enlarged right side elevation of part of the machine shown in Figs. 1 and 2, a right ground wheel being omitted in Fig. 3 and its supporting axle shown in section;

Fig. 4 is an enlarged left side elevation of part of the machine shown in Fig. 1, but with some parts in different positions;

Fig. 5 is a section on line V—V of Fig. 1 showing right and left end portions of the mechanism with an intermediate portion thereof broken away;

Fig. 6 is a section on line VI—VI of Fig. 5;

Fig. 7 is a section on line VII—VII of Fig. 5;

Fig. 8 is an enlarged view of a detail;

Fig. 9 is a section on line IX—IX of Fig. 8; and

Fig. 10 is a perspective view of a detail.

Referring to the drawings, the principal component parts of the machine are a material supply mechanism, generally indicated by the reference numeral 1, and a bale forming or processing mechanism, generally indicated by the reference numeral 2. The bale forming mechanism is of the rotary type and conforms in some respects with well known principles of construction and operation of mechanism of this type. The main frame 3 of the bale forming mechanism is supported on right and left ground wheels 4 and 6 (see Fig. 2) and has a forwardly extending draft structure 7. A suitable hitch device (not shown) will be mounted on the forward end of the draft structure 7 for connection with the drawbar of a tractor in conventional manner.

Power for operating the bale forming or processing mechanism 2 is derived from a tractor power take-off shaft (not shown) and transmitted to a gear mechanism 8 (Figs. 2 and 3) by means of a line shaft 9. The gear

mechanism 8 has a power input shaft 11 and is suitably connected through another gear mechanism 12 (Fig. 3) with a lower drive roll 13 and an upper drive roll 14 (Figs. 1 and 4) of the bale forming mechanism.

The bale forming mechanism is of generally conventional construction and comprises a lower set of bale rolling belts 16 and an upper set of bale rolling belts 17 forming between them a variable size bale rolling chamber. The lower belts 16 are trained about the lower drive roll 13, a lower tension roll 18 and a lower trip roll 19. The lower tension roll 18 is rotatably mounted for up and down swinging movement about a pivot centre 21 by means of a lower tension arm 22 at the left side of the machine, and a corresponding tension arm 23 (Fig. 3) at the right side of the machine. The upper bale rolling belts 17 are trained about the upper drive roll 14, an upper tension roll 24 and an upper trip roll 26. The upper tension roll 24 is rotatably mounted for up and down swinging movement about a pivot centre 27 by means of an upper tension arm 28 at the left side of the machine and by a corresponding upper tension arm 29 (Fig. 3) at the right side of the machine.

A connecting rod 31 at the left side of the machine has a lower end connected to the lower tension arm 22 and is operatively connected at its upper end with the upper tension arm 28, and a similar connecting rod 32 at the right side of the machine is pivotally connected at its lower end with the lower tension arm 23 and at its upper end with the upper tension arm 29. A strong tension spring 33 (Fig. 3) is anchored at its lower end on the main frame 3 and is operatively connected at its upper end with the upper tension arms 28 and 29 so as to bias the latter in anticlockwise direction as viewed in Fig. 3, and in clockwise direction as viewed in Fig. 1 about the pivot centre 27. The connecting rods 31 and 32 transmit pivotal movement of the upper tension arms 28 and 29, to the lower tension arms 22 and 23 so that the upper and lower tension arms will move in unison about their respective pivot centres 27 and 21 during the operations of forming the bale and ejecting it from the machine.

A toggle linkage 34 of conventional construction is operatively connected with the trip rolls 19 and 26 and with the lower end of a bow member 36 at the left side of the machine. A similar toggle linkage 37 (Fig. 3) at the right side of the machine is operatively connected with the lower and upper trip rolls 19 and 26 and with a bow member 38. The bow members 36 and 38 are pivotally suspended at their upper ends on arms 39 and 41, respectively, which are swingable about the pivot centre 27 and are biased in clockwise direction, as viewed in Fig. 1, and in anticlockwise direction as viewed in Fig. 3, by a tension spring 42 at the left side of the machine and another tension spring 45 at the right side of the machine.

Each of the toggle linkages 34 and 37 includes a latch mechanism (not shown) which retains the trip rolls 19 and 26 in proximity to each other as shown in Figs. 1 and 3 during the bale rolling operation of the machine. When a bale of desired diameter has been formed in the bale rolling chamber, the latch mechanism for the trip rolls is disengaged by a suitable control linkage so that the trip rolls 19 and 26 may move apart and permit the formed bale to be ejected from the machine by the contracting force of the tension spring 33.

In the condition of the machine as shown in Fig. 1, a round bale 43 of less than the final diameter has been formed in the bale rolling chamber by the lower and upper belts 16 and 17. A spring loaded press roll 44 is mounted above the lower drive roll 13 and forwardly of the upper drive roll 14 to which it is connected by a pair of meshing spur gears as indicated in Fig. 1. Material which enters between the press roll 44 and the lower set of belts 16 is advanced in the form of a mat toward the rear through a gap between the lower drive roll 13 and the upper drive roll 14. These rolls are continuously driven in the direction of the arrows shown in Fig. 1, and as long as the feed of material into the bale rolling chamber continues, the bale grows steadily in diameter. As a result of such bale growth the lower tension arms 22 and 23 are moved steadily upward about the pivot centre 21, and the upper tension arms 28 and 29 are steadily moved downward about the pivot centre 27 during the bale rolling operation of the machine. When the bale 43 has reached the desired final diameter the feed of material into the bale rolling chamber is automatically stopped as will hereinafter be described.

A conventional twine dispensing mechanism becomes automatically effective after the feed of material into the bale rolling chamber has been stopped so as to wrap the bale of final diameter with twine. This mechanism is mounted at the upper forward part of the main frame 3 and, briefly, functions as follows. Twine (not shown) from a can 46 at the right side of the machine is passed through a twine guide tube 47 which is suitably mounted at one end for pivotal movement so that its other end can be swept lengthwise of the formed bale and the twine will be wrapped spirally about the bale during such lengthwise sweep of the twine tube 47.

Also, in conformity with established practice, the machine is equipped with a cycling mechanism, (i.e. a mechanism for automatically causing actuation of a number of operating mechanisms at predetermined intervals, so that a cycle of operations may be repeatedly

carried out in exactly the same order), for automatically controlling the bale forming, the twine wrapping and the bale ejecting phases of the operating cycle of the machine. Said cycling mechanism includes a drive shaft 48 (Fig. 1) which is continuously driven from the lower drive roll 13 by means of a belt 49; a control linkage for the twine tube 47; and a control linkage for the latch mechanism of the trip roll toggles 34 and 37.

The control linkage for the twine tube 47 is shown in Fig. 1 and comprises a spring biased bell crank lever 51; a second bell crank lever 52; a connecting link 53 between the bell crank levers 51 and 52; and an up and down movable actuating rod 54 for the bell crank lever 52.

The actuating linkage for the latch mechanism of the trip roll toggles 34 and 37 includes an up and down shiftable link 56 which is automatically pulled upward at the end of the twine wrapping operation in order to initiate the bale ejecting operation by release of the latch mechanism for the trip roll toggles 34 and 37.

Referring to Figs. 4 and 10, it will be seen that a rock shaft 58 is rotatably supported in a generally upright angle brace 61 of the main frame and in a bracket strap 62 which is secured to the angle brace 61 by bolts 63 and spacers 64. Rigidly secured to the inner or right end of the rock shaft 58 is a trip arm 57 which extends radially from the shaft 58 in opposite directions. The forwardly extending portion of the trip arm 57 is pivotally connected with the lower end of the actuating rod 54. The rearwardly extending portion of the trip arm 57 has an actuating connection with the lower tension arm 22, as shown in Fig. 1, which will be described more fully hereinbelow.

The outer or left end of the rock shaft 58 mounts a clutch release arm 66 which is non-rotatably secured to the shaft 58 and secured in position by a nut 67 on a threaded extension of the shaft 58. A bushing 68 is rotatably mounted on the shaft 58 between the frame angle 61 and the bracket 62. Rigidly secured to the bushing 68 is a clutch stop arm 69 which extends radially of the bushinng 68 in opposite directions. The forwardly extending portion of the arm 69 mounts a clutch throwout roller 71, and a spring attaching stud 72 is mounted on the rearwardly extending portion of the clutch stop arm 69.

The mechanism shown in Fig. 10 has two purposes. One is to initiate the twine wrapping operation, and the other is to stop the feed to the bale rolling chamber after a bale of desired diameter has been formed. The twine wrapping phase of the operating cycle of the machine starts shortly before the last part of the material for the finished bale has been fed into the bale rolling chamber.

In order to accomplish this result, a clutch release link 73 is operatively interposed between the lower tension arm 22 and the rearwardly extending portion of the trip arm 57. A pin 74 (Fig. 10) extends laterally from the rear end of the trip arm 57, and the link 73 has an upper section which is pivotally connected with the pin 74. The link 73 has a lower section which is adjustable lengthwise of its upper section, and a jam nut 75 on the lower link section may be drawn up against the upper link section in order to lock the two link sections in a predetermined position of lengthwise adjustment relative to each other. The lower section of the link 73 has a pin and slot connection 76 with the lower tension arm 22 as shown in Fig. 4.

When the lower tension arm approaches the bale finishing position in which it is shown in Fig. 4, the play afforded by the pin and slot connection 76 is taken up and the trip arm 57 is rocked from the position in which it is shown in Fig. 1 to the position in which it is shown in Fig. 4. Such rocking movement of the trip arm 57 causes downward movement of the actuating rod 54 to an extent sufficient to pull the bell crank lever 51 out of supporting engagement with the twin tube 47. The twine tube 47 then drops to a lowered position and presents the free end of projecting twine to the material which moves int othe bale rolling chamber. Shortly after the twine tube 47 has been dropped the feed of material into the bale rolling chamber is stopped in response to a short anticlockwise rocking movement of the clutch stop arm 69, as will be hereinafter more fully described. The twine will, therefore, be entrained only by the last part of the material which moves into the bale rolling chamber, and a subsequent sweep of the twine tube lengthwise of the bale will cause the twine to be wrapped spirally about the bale of final diameter.

At the end of the wrapping operation, the twine tube 47 is returned to its original raised position, and a short upward stroke is imparted to the actuating link 56 for the latch mechanism of the trip roll toggles 34 and 37. As a result of such upward stroke of the link 56, the bale rolling chamber is opened by separation of the trip rolls 19 and 26 and the twine wrapped bale is ejected from the machine under the action of the tension spring 33. As soon as the bale rolling chamber is opened the load which is imposed upon the lower tension arms 22 and 23 by the lower belts 16, and the load which is imposed upon the upper tension arms 28 and 29 by the upper belts 17 is relieved so that the lower tension arms are returned to their lower bale starting positions by the tension of the spring 33, and the upper tension arms 28 and 29 are likewise returned to their bale starting positions. As soon as the bale has been ejected the bow members 36 and 38 are also

returned to their bale starting positions by the tension f springs 42 and 45, and the latch mechanism for the trip roll toggles is automatically re-engaged by such return movement of the bow members 36 and 38.

The downward movement of the lower tension arm 22 referred to, upon ejection of the bale from the bale rolling chamber, returns the twine tube control linkage 51, 52, 53 and 54 to the position in which it is shown in Fig. 1 and in which the twine tube 47 is supported by the bell crank lever 51.

From the foregoing description, it will be understood that the bale forming mechanism 2 has a predetermined operating cycle including a material admitting phase and a material cut-off phase. The material supply mechanism 1 is continuously operable to gather material while the machine is being advanced in the field; to feed gathered material to the bale forming mechanism, by feed mechanism to be hereinafter described, during the material admitting phase; and to return the fed material from a delivery outlet of the feed mechanism to an inlet thereof during the material cut-off phase of the operating cycle. In order to accomplish these results the construction of the supply mechanism 1 will now be described.

Referring to Fig. 1, a generally rigid supporting structure 77 of the material supply mechanism 1 is pivotally connected with the main frame 3 on the axis of the lower drive roll 13. A mechanism for raising and lowering the frame 77 about the axis of the lower drive roll 13 is of conventional construction and includes a lift rod 78 at the left side of the machine and a corresponding lift rod 79 at the right side of the machine.

A feed mechanism in the form of an endless raddle type pickup conveyor 81 is operatively mounted on the forward part of the frame 77 and includes a forward sprocket shaft 82 and a rearward sprocket shaft 83. The conveyor 81 is driven continuously so as to pick up material at its forward or inlet end and to move it rearwardly along the upper side of a rearwardly and upwardly inclined deck sheet of the supporting structure 77 to a delivery outlet. The rear sprocket shaft 83 at the delivery outlet end of the pickup conveyor 81 is spaced a substantial forward distance from the bale forming mechanism of the machine.

Transfer means comprising an auxiliary conveyor, generally indicated at 84, is arranged, as shown in Fig. 1, in the space between the delivery outlet end of the pickup conveyor 81 and the lower drive roll 13 of the bale forming mechanism.

The auxiliary conveyor 84 is shown separately in Figs. 5, 6 and 7 and is of special construction which will now be described. As shown in Fig. 6, a shaft 86 which forms the forward drive shaft of the auxiliary conveyor 84 is rotatably mounted in bearings 87 and 88 which are rigidly secured to side walls 89 and 91 at left and right sides, respectively, of the supporting structure 77. Swingably mounted on the shaft 86, in the space between the side walls 89 and 91, is a frame, generally indicated at 92, comprising side members 93 and 94 (Fig. 5) and an apron 96 (Fig. 7) rigidly connected with the side members 93 and 94 and extending rearwardly from and in slightly elevated relation to the shaft 86. Mounted in forward portions of the side members 93 and 94 are bearings 97 and 98, respectively, by means of which the frame 92 is pivotally mounted on the shaft 86 for swinging movement about the axis of the latter. Rollers 99 and 101 are rotatably mounted at the rear ends of the side members 93 and 94, respectively, and sprocket wheels 102 and 103 are fixedly secured to the shaft 86 in line with the rollers 99 and 101, respectively.

A conveyor chain 104 is trained about the sprocket wheel 102 and roller 99, and a similar conveyor chain 106 is trained about the sprocket wheel 103 and the roller 101. A series of cross slats 107 are secured at their opposite ends to the chains 104 and 106, respectively, and mount spring fingers 108. The assembly of chains, cross members and spring fingers provides an endless conveying element of the auxiliary conveyor whose upper stretch is supported on the apron 96. Reinforcing angles 109 are secured to the underside of the apron 96 and the forward end of the latter is curved downwardly about the shaft 86, as shown in Fig. 7.

In addition to the sprocket wheels 102 and 103, a driving sprocket 111 and a belt pulley 112 are fixedly secured to the shaft 86 as shown in Figs. 5 and 6. Also secured to the side members 93 and 94 of the auxiliary conveyor frame are depending arms 113 and 114, respectively, which are cross connected at their free ends by a tubular transverse brace 116. As shown in Fig. 6, the brace 116 projects outwardly beyond the arm 113 and a side arm 117 of square tubing is welded to the outwardly extending end portion of the brace 116. The arm 117 extends outwardly from the arm 113 in parallel relation to the shaft 86 and beyond the belt pulley 112. The entire frame 92 of the auxiliary conveyor together with the associated endless conveying element made up of the chains 104, 106, and cross-slats 107 may be rocked about the axis of the shaft 86 by back and forth movement of an actuating link 118 (Fig. 1) which is pivotally connected to a stud 119 (Fig. 6) at the outer end of the side arm 117.

In the operating condition of the baling machine shown in Fig. 1, the auxiliary conveyor 84 is shown in a position generally in line with the pickup conveyor 81 and, in operation, the conveying element of the auxiliary conveyor 84 is driven in the same

direction as the conveying element of the pick-up conveyor 81. Material which is picked up by the conveyor 81 and delivered to the auxiliary conveyor 84 will therefore be advanced rearwardly toward the bale forming mechanism as long as the auxiliary conveyor 84 is in the downwardly adjusted position in which it is shown in Fig. 1. At the end of the bale forming operation the auxiliary conveyor 84 is tilted upwardly from the position in which it is shown in Fig. 1 to the position in which it is shown in Fig. 4, and such upward tilting of the auxiliary conveyor 84 is accomplished by means of an actuating mechanism including a partial revolution clutch generally indicated at 122.

The partial revolution clutch 122 is of conventional well known construction and is shown in detail in Figs. 8 and 9. The driving member 123 of the clutch is fixedly secured to the continuously rotating shaft 124 of the lower drive roll 13. The driven member 125 is journalled on the outer end of the shaft 124, and a rocker 126 is pivotally mounted on the driven member 125 by means of a pivot pin 127. An arcuate slot 128 in the driven clutch member 125 provides an aperture through which a pin 129 extends into the interior space of the clutch. The pin 129 mounts a roller 131 which is movable into and out of co-operative engagement with a scalloped inner surface 132 of the driving clutch member 123 by pivotal movement of the rocker 126 about the pin 127. A coil spring 133 which is connected with the rocker 126 and with the driven clutch member 125 biases the rocker 126 toward its clutch engaged position in which the roller 131 is seated in one of the cavities of the scalloped surface 132. The driven clutch member 125 has a radial notch 134 which in the position of the parts as shown in Figs. 1 and 8 accommodates the roller 71 of the control mechanism shown in Fig. 10. In the condition of the clutch, as shown in Figs. 1 and 8, the roller 131 is kept out of engagement with the scalloped surface 132 by contact of stop surface 136 of the rocker 126 with the roller 71.

The actuating link 118 for the auxiliary conveyor 84 which, as stated, is pivotally connected at its forward end with the side arm 117 of the auxiliary conveyor frame 92, is pivotally connected at its rear end with the driven member 125 of the clutch 122 by means of the pin 127. The driving member 123 of the clutch, as shown in Fig. 9, has a conical rear surface which in conjunction with a conical disc 137 forms a driving sheave for the belt 49 (Fig. 1) which drives the cycling mechanism of the baling machine.

When the lower tension arm 22 approaches its bale finishing position in which it is shown in Fig. 4, the link 73 pushes upward on the pin 74 (Fig. 10) of the trip arm 57. Such push on the trip arm 57 causes a pin 138 on the clutch release arm 66 to engage the lower edge of the clutch stop arm 69 and, as a result, the roller 71 will be forced out of the notch 134 of the driven clutch member 125. Such outward movement of the roller 71 continues until it clears the stop surface 136 of the rocker 126. As soon as the roller 71 clears the stop surface 136, the spring 133 pivots the rocker 126 on the pin 127 and thereby engages the roller 131 with one of the cavities of the scalloped surface 132. The driven member 125 is now locked to the driving member 123 and the entire clutch assembly will begin to rotate in clockwise direction as viewed in Fig. 1. Such rotation of the clutch assembly will continue for about one-half revolution, and the clutch is then automatically disengaged by co-action of the stop surface 136 of the rocker 126 with another roller 139. (Fig. 4) which is rotatably mounted on an upper clutch stop arm 141. The arm 141 is pivoted on the main frame 3 at 142, and a tension spring 143 is operatively interposed between the lower and upper clutch stop arms 69 and 141 so as to bias the arm 141 downward and the arm 69 upward. The spring 143 is hooked at its lower end over a pin 144. (Fig. 10) on the lower clutch stop arm 69 and the upper end of the spring 143 is hooked into a strap 146 which has a pivot connection at 147 with the upper clutch stop arm 141. Another coil spring 148 (Fig. 4) is hooked to the pin 72 (Fig. 10) of the lower clutch stop arm 69 and is anchored at its other end on the main frame, the purpose of the spring 148 being to bias the lower clutch stop arm 69 clockwise, as viewed in Fig. 4, about the rock shaft 58.

Also pivoted to the upper clutch stop arm 141 at 147 is an actuating rod 149 which extends upwardly toward a bail 151 which is pivotally mounted on the main frame 3 at 152 and forms part of the conventional control mechanism for the baler. The upper end of the rod 149 has a spring cushioned actuating connection with the bail 151 so that it may be given a short upward stroke when the bow members 36 and 38 hit the bail 151 upon their return movement to normal position after the bale has been ejected.

With the various parts in the positions shown in Fig. 4, the roller 139 of the upper clutch stop arm is seated in the notch 134 of the driven clutch member, and the rocker 126 is kept in clutch disengaged position by co-action of the stop surface 136 with the roller 139. When the actuating rod 149 is pulled upward after a bale has been ejected, such upward pull of the rod 149 lifts the roller 139 from the position in which it is shown in Fig. 4 so that the clutch becomes engaged and the whole clutch assembly starts to rotate in clockwise direction as viewed in Fig. 4.

As soon as the bale has been ejected, the lower tension arm 22 moves rapidly downward from the bale finishing position in which it is shown in Fig. 4 to a bale starting position (not shown). Such downward movement of the lower tension arm 22 is followed by downward movement of the push link 73 and consequent clockwise movement of the lower clutch stop arm 69 about the rock shaft 58 under the tension of the spring 148. As a result, the lower clutch stop arm 69 and its associated roller 71 will be moved from the position in which they are shown in Fig. 4 against the periphery of the driven clutch member 125 immediately upon ejection of the bale and at about the same time as the upper clutch stop arm 141 and its associated roller 139 are lifted from the position in which they are shown in Fig. 4. Rotation of the driven clutch member 125 from the position in which it is shown in Fig. 4 stops when the stop surface 136 of the rocker 126 engages the roller 71 and the roller is forced into the notch 134 by the tension of springs 143 and 148. This establishes the condition of the clutch in which it is shown in Fig. 1.

From the foregoing description, it will be noted that upon formation of a bale of predetermined diameter, the driven member 125 of the clutch 122 is rotatable by a first partial revolution from the position in which it is shown in Fig. 1 and which may be termed a first position, to the position in which the driven clutch member 125 is shown in Fig. 4 and which may be termed a second position. A second partial revolution of the driven clutch member from its second to its first position is automatically effected by operation of the cycling mechanism of the baling machine upon ejection of a twine wrapped bale from the machine.

When the driven clutch member 125 moves from its mentioned first position (Fig. 1) to its mentioned second position (Fig. 4) in the hereinbefore described manner, upon formation of a bale of desired diameter, the link 118 moves rearwardly from the position in which it is shown in Fig. 1 and, as a result the auxiliary conveyor 84 is tilted from its lowered position (Fig. 1) to its upwardly inclined position (Fig. 4) by said first partial revolution of the driven clutch member 125. Similarly, when the driven clutch member 125 moves from its second position (Fig. 4) to its first position (Fig. 1) in the hereinbefore mentioned manner, upon ejection of the bale from the machine the link 118 moves forwardly from the position in which it is shown in Fig. 4 and, as a result, the auxiliary conveyor 84 is tilted from its raised position (Fig. 4) to its lowered position (Fig. 1) by said second partial revolution of the driven clutch member 125.

Referring to Fig. 1, the supply mechanism 1 also includes in addition to the pickup conveyor 81 and auxiliary conveyor 84, a return conveyor means, generally indicated at 153, a reversible rotary material impelling means, forming an additional element in the transfer means, and generally indicated at 154, and an auxiliary beater means 156.

The return conveyor means 153 is in the form of an endless conveyor which is disposed above the feed mechanism conveyor 81 and which comprises a trough 157 which is pivotally supported at its rear end on a shaft 158. The shaft 158 is rotatably mounted in upwardly extending side members of the supporting structure 77 for the conveyors 81 and 84. A mid-portion of the trough 157 of the return conveyor is sustained by a pair of rearwardly and upwardly extending brace rods 159, only one being shown in Fig. 1. The brace rods 159 have rearward connections (not shown) with the main frame 3 and their forward ends are secured to opposite sides of the trough 157. At the forward end of the conveyor trough 157 transversely spaced rollers 166 and 167 are rotatably mounted on an axis extending parallel to the shaft 158. An endless conveying element 162 of the return conveyor is trained about the rollers 166 and 167 and about drive sprockets 163 and 164 (Fig. 2) on the shaft 158. Cross members of the endless conveying element 162 are conventionally equipped with spring tines 168. Similar spring tines 169 are mounted on cross members of the pickup conveyor 81. The upper run of the conveying element 162 is supported on a bottom wall 161 of the trough 157.

The reversible rotary impelling means 154 is in the form of a main feeder beater which, similar to the auxiliary conveyor 84, is automatically selectively adjustable to a first operating condition in which it rotates in a direction to assist the feed of hay into the bale forming mechanism by the auxiliary conveyor 84, or to a second operating condition in which it rotates in a direction to assist the auxiliary conveyor 84 to pass the hay to the return conveyor. The reversible rotary impelling means 154 (hereinafter referred to in the description as the " main feeder beater 154 ") comprises a shaft 171 which is rotatably mounted at its opposite ends in opposite side walls of the supporting structure 77 for the pickup and auxiliary conveyors. Three beater paddles 172 extend radially at equal circumferential spacings from the shaft 171 within the space between the side walls of the supporting structure 77.

The auxiliary beater means 156 comprises a shaft 173 which like the shaft 171 is rotatably mounted at its opposite ends in opposite side walls of the supporting structure 77. Like the main feeder beater, the auxiliary beater 156 has three equally spaced beater paddles 174.

Power for driving the pickup conveyor 81,

the auxiliary conveyor 84, the return conveyor means 153, the main feeder beater 154 and the auxiliary beater 156 is derived from the gear mechanism 8 (Fig. 2). Referring to Figs. 2 and 3, a continuously rotating power outlet shaft 176 extends horizontally from the right end of the gear mechanism 8 and mounts a belt sheave 177. A countershaft 178 at the forward side of the gear mechanism 8 mounts a complementary belt sheave 179 and is driven from the sheave 177 by means of a belt 181. A tensioning idler 180 for the belt 181 is rotatably mounted on a spring loaded supporting arm, not shown.

The countershaft 178 drives a sprocket wheel 182 at the right side of the conveyor supporting structure 77 by means of telescopic shaft 183 and universal joints 184 and 186. The sprocket wheel 182, as shown in Fig. 3, drives a sprocket wheel 187 by means of a chain 188. The sprocket wheel 187 is fixedly secured to the right end of the shaft 83 which projects outwardly from the right side of the conveyor supporting structure 77. The left end of the shaft 83 which extends outwardly from the left side of the conveyor supporting structure 77 mounts a sprocket wheel 192 in the same vertical plane as the sprocket wheel 111 on the auxiliary conveyor drive shaft 86. Additional sprocket wheels 193 and 194 are fixedly secured, respectively, to the drive shaft 158 of the return conveyor and to the auxiliary beater shaft 173, at the left side of the supporting structure 77. An endless chain 196 connects the sprockets 111, 192, 193 and 194 in power transmitting relation with each other, and a tensioning idler 197 for the chain 196 is adjustably mounted on the supporting structure 77 forwardly of the sprocket wheel 193.

The shaft 83 is continuously driven in clockwise direction as indicated by arrow 198 in Fig. 4 and consequently the auxiliary conveyor drive shaft 86 is also driven in clockwise direction as viewed in Fig. 4. From the sprocket 111 the chain 196 passes over the sprocket 194, under the sprocket 193 and over the idler 197 back to the sprocket 192. The auxiliary beater drive sprocket 194 will therefore be rotated in clockwise direction and the return conveyor drive sprocket 193 will be rotated in anti-clockwise direction while the pickup and auxiliary conveyor drive sprockets 192 and 111 are rotated in clockwise direction. Clockwise rotation of the sprocket 192 in the described manner causes the upper stretch of the pickup conveyor to move rearwardly. At the same time anticlockwise rotation of the sprocket 193 causes the upper stretch of the endless conveying element 162 of the return conveyor to move forwardly.

The main feeder beater 154 is selectively rotatable in opposite directions by means of a reversible drive mechanism which is constructed as follows. Referring to Figs. 2 and 4, a double groove belt sheave 199 is secured to the end of the shaft 171 at the left side of the supporting structure 77, and a single groove belt sheave 201 is secured to the return conveyor shaft 158 at the left side of the supporting structure 77. An endless V-belt 202 is placed around the sheave 112 and 199 so as to ride in the V-groove of the sheave 112 and in the axially outer V-groove of the sheave 199. Another endless V-belt 203 is placed around the sheaves 193 and 199 so as to ride in the V-groove of the sheave 193 and in the axially inner V-groove of the sheave 199. The length of the belt 202 is appreciably greater than that of a normally tensioned power transmitting belt between the sheaves 112 and 199 whose length would be conventionally determined by the centre spacing of these sheaves and the pitch diameters of their belt engaging V-grooves. Similarly, the length of the belt 203 is appreciably greater than that of a normally tensioned power transmitting belt between the sheaves 193 and 199 whose length would be conventionally determined by the centre spacing of these sheaves and the pitch diameters of their belt engaging V-grooves.

In the condition of the mechanism as shown in Fig. 4, the slack of the belt 202 is taken up by a tensioning idler 204 which is rotatably mounted on the free end of the swingable arm 206. The arm 206 is pivoted at 207 on the supporting structure 77 and is actuated by a thrust link 208. The lower end of the thrust link 208 is pivotally connected at 209 to the free end of an actuating arm 211 which is rigidly secured, as by welding, to the side arm 117 (Fig. 6) of the auxiliary conveyor frame 92. As shown in Fig. 4, the actuating arm 211 extends transversely of the side arm 117 at a fixed angle which remains unchanged when the auxiliary conveyor is swung from the raised position in which it is shown in Fig. 4, to the lowered position in which it is shown in Fig. 1. The thrust link 208 has a rod portion 212 which extends through a side lug 213 of the idler supporting arm 206. The rod portion 212 is slidable lengthwise within the side lug 213, and buffer springs 214 and 216 are placed around the rod 212 below and above the lug 213.

In the condition of the mechanism, as shown in Fig. 4, the buffer spring 214 is compressed and the belt 202 is thereby placed under sufficient tension to effectively transmit power from the sheave 112 to the sheave 199. A complementary idler 217 is mounted on the supporting structure 77 at a fixed location for co-operation with the belt 202 in the tensioned condition of the latter.

Transmission of power from the sheave 112 to the sheave 199 through the belt 202 in the hereinbefore described manner causes the main feeder beater 154 to rotate in clockwise direction as viewed in Fig. 4. The rota-

tion of the main feeder beater 154 is automatically reversed when the auxiliary conveyor 84 is moved from its raised to its lowered position by operation of the partial revolution clutch 122. Lowering movement of the auxiliary conveyor 84 causes downward swinging movement of the pivot connection 209 between the actuating arm 211 and the thrust link 208 and consequent downward movement of the thrust link 208 to the position in which it is shown in Fig. 1. As a result of the downward movement of the thrust link 208, the idler supporting arm 206 is moved to a downwardly adjusted position in which the tensioning idler 204 is out of co-operative engagement with the belt 202 and in co-operative engagement with the lower stretch of the belt 203. The buffer spring 216 above the side lug 213 is compressed in the condition of the parts as illustrated by Fig. 1, and as a result, the belt 203 is properly tensioned to transmit power from the sheave 201 to the sheave 199. As heretofore described, the direction in which the sheave 201 rotates is opposite to the direction in which the sheave 112 rotates, and the main feeder beater 154 will therefore be rotated in anticlockwise direction in the condition of the mechanism, as shown in Fig. 1.

When the machine is operated in the field while the driven member 125 of the partial revolution clutch is in its first position, as shown in Fig. 1, hay enters the supply mechanism 1 at the forward end of the pickup conveyor 81 and is passed from the delivery end of the latter to the auxiliary conveyor 84. The main feeder beater 154 will rotate in an anticlockwise direction, and as a result of the combined action of the auxiliary conveyor 84 and the main feeder beater 154, hay is passed to the feed roll 44 and from the latter into the bale forming chamber between the upper and lower belts 16 and 17. The feed of material into the bale rolling chamber continues for the duration of the bale forming operation. At the end of the bale compacting operation the partial revolution clutch 122 is automatically engaged by operation of its trip mechanism which includes the clutch stop arm 69 and trip roller 71, with the result that the auxiliary conveyor 84 is moved to its raised position and the anticlockwise rotation of the main feeder beater 154 is changed to clockwise rotation. The supply mechanism 1 now operates to circulate the picked up hay in an endless path exteriorly of the bale rolling belts and thereby forms it into an extended mat of progressively increasing thickness on the upper run of the pickup conveyor 81. This result is obtained by delivery of hay from the pickup conveyor 81 to the raised auxiliary conveyor 84 and by the impelling action of the main feeder beater 154 which in conjunction with the impelling action of the auxiliary beater 156 causes passage of hay to the rear or inlet end of the return conveyor 153. The upper run of the return conveyor means 153 feeds the material forwardly to an outlet thereof and drops it from the outlet upon the adjacent inlet end of the pickup conveyor 81. A series of deflecting rods 218 are loosely suspended within the trough 157 above the return conveyor 153 and the forward ends of the deflecting rods 218 are curved downward in front of the return conveyor so as to assist passage of material from the return conveyor to the pickup conveyor.

The condition of the supply mechanism 1 in which the incoming material is returned from the delivery end of the pickup conveyor to the inlet end of the pickup conveyor by the return conveyor is maintained for the duration of the material cut-off phase of the bale forming mechanism. This cut-off phase includes the twine wrapping phase and the bale ejecting phase which are automatically controlled by the cycling mechanism of the baling machine in conventional manner as hereinbefore described.

The auxiliary conveyor 84 and the main feeder beater 154, comprising the transfer means, are both automatically selectively adjustable either to a first operating condition as shown in Fig. 1 for passing material from the delivery end of the lower conveyor 81 to the bale forming mechanism, or to a second operating condition as shown in Fig. 4 for passing material from the delivery end of the lower conveyor 81 to the inlet end of the upper return conveyor means 153. The passage of material to the return conveyor means is assisted by the auxiliary beater 156.

Control means, which are operable to adjust the transfer means to either said first or second operating conditions, include the partial revolution clutch 122 and the thrust link 208 for actuating the reversible drive of the feeder beater 154. The control means for the transfer means is operatively connected with the bale forming mechanism by the actuating rods 54 and 56 and associated parts so that the transfer means will be in the first operating condition (Fig. 1) during the material admitting phase of the operating cycle of the bale forming mechanism and in the second operating condition (Fig. 4) during the material cut-off phase of the bale forming mechanism.

Depending on the duration of wrapping phase of the operating cycle the amount of material which is being circulated by the supply mechanism will be larger or smaller. Provisions may be made to perform the wrapping operation within a relatively short time as by the use of a two speed transmission for driving the lower and upper drive rolls 13 and 14 and the actuating mechanism of the twine guide tube 47 as in Specification No. 785,586.

If the wrapping phase of the operating

cycle is relatively long, an extended mat of double thickness may be formed on the lower conveyor 81 during the material cut-off phase of the operating cycle and while the machine is being propelled continuously in the field. When the auxiliary conveyor is placed into its lowered position after the mat of double thickness has been formed on the lower conveyor such mat will be passed to the bale forming mechanism by the combined action of the auxiliary conveyor 84 and main feeder beater 154. Movement of the double thickness mat or of a mat of even greater thickness involving three or more layers toward the baling mechanism will be assisted by the lower run of the upper conveyor 153 which continuously moves rearward during the operation of the machine.

WHAT WE CLAIM IS:—

1. A baling machine of the type in which a supply mechanism for delivering material to a bale forming mechanism includes a continuously operable feed mechanism for feeding material from an inlet to a delivery outlet from which the material is intermittently passed to the bale forming mechanism which has a predetermined operating cycle including a material admitting phase, during which material is passed from the delivery outlet to the bale forming mechanism, and a material cut-off phase, during which passage of material to the bale forming mechanism is cut-off, characterised by the provision of transfer means disposed at the delivery outlet of the feed mechanism and automatically selectively adjustable either to a first operating condition for passing material from the delivery outlet to the bale forming mechanism, during the material admitting phase, or to a second operating condition for causing material to return from the delivery outlet to the feed mechanism inlet, during the cut-off phase.

2. A baling machine according to Claim 1 in which control means are provided, actuatable by the bale forming mechanism, for automatically selectively adjusting the transfer means to said first or second operating conditions in accordance with the respective phases of the predetermined operating cycle of the bale forming mechanism.

3. A baling machine according to Claim 2 in which said control means comprises a partial revolution clutch having a continuously rotatable driving element, an intermittently rotatable driven element, and trip means which are operatively connected to the bale forming mechanism for actuation thereby so as to cause a first partial revolution of the clutch driven element at the end of the material admitting phase to thereby adjust the transfer means to its second operating condition, and to cause a second partial revolution of the clutch driven element at the end of the material cut-off phase to thereby adjust the transfer means to its first operating condition.

4. A baling machine according to Claim 3 in which motion transmitting means are operatively interposed between the clutch driven element and the transfer means for adjusting the latter to one or other of its operating conditions.

5. A baling machine according to any of Claims 1 to 4 in which the transfer means comprise an endless conveyor pivotally mounted adjacent the delivery outlet of the feed mechanism for swinging movement between a lowered first operating position and a raised second operating position.

6. A baling machine according to Claim 5 in which return conveyor means are provided for receiving material from the transfer means when the latter is in the second operating position, and delivering said material back to the feed mechanism inlet.

7. A baling machine according to Claim 6 in which said return conveyor means is disposed above the feed mechanism with the outlet thereof adjacent the inlet of said feed mechanism.

8. A baling machine according to Claims 4 and 7, in which the endless conveyor is operatively connected by lever means to the motion transmitting means for movement thereby from the lowered first operating position in which the conveyor is generally in line with the feed mechanism which is in the form of an endless conveyor, to the raised second operating position for conveying material to the upper return conveyor means.

9. A baling machine according to any of Claims 6 to 8 in which the transfer means includes a reversible rotary material impelling means which is operatively disposed adjacent the endless conveyor and is automatically selectively adjustable to a first operating condition in which said means is rotatable in a direction for feeding material into the bale forming mechanism, when said endless conveyor is in the first operating position, or to a second operating condition in which said means is rotatable in the other direction for passing material to the return conveyor means when said endless conveyor is in the second operating position.

10. A baling machine according to Claim 9 in which reversing means are provided for said impelling means, said reversing means being operatively connected with the bale forming mechanism so that the impelling means will automatically be adjusted for drive in one direction during material admitting phase and for drive in the other direction during material cut-off phase.

11. A baling machine according to Claim 9 or 10 in which auxiliary beater means is rotatably mounted adjacent the impelling means and is drivable in a direction to assist material passing from the impelling means to the return conveyor means.

12. A baling machine according to Claim 11

in which said auxiliary beater means is mounted above said impelling means and between said impelling means and return conveyor means.

13. A baling machine constructed, arranged and adapted to operate substantially as described herein with reference to and as shown in the accompanying drawings.

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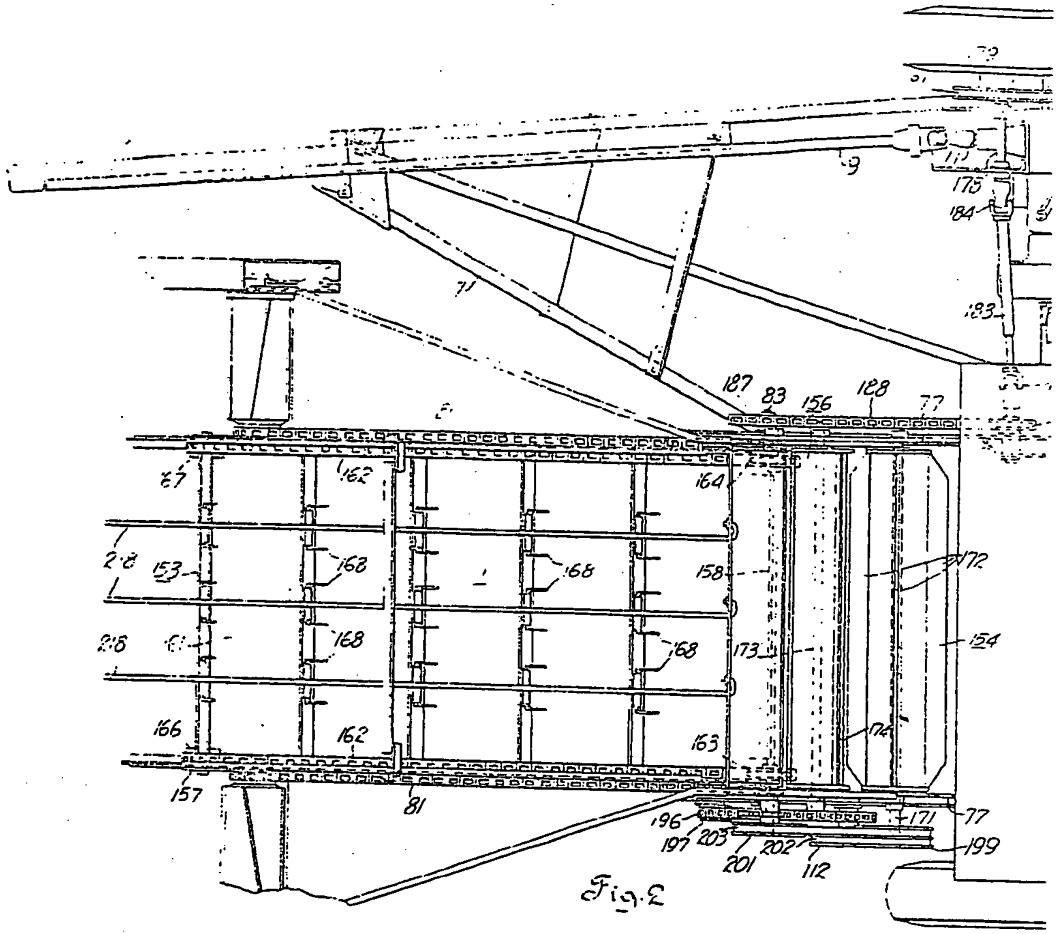
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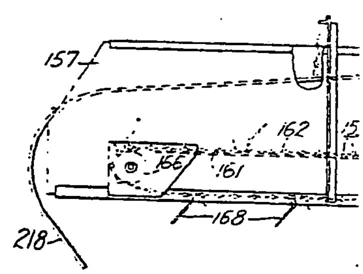
Fig.2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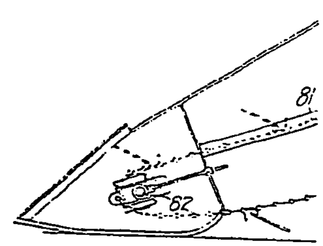
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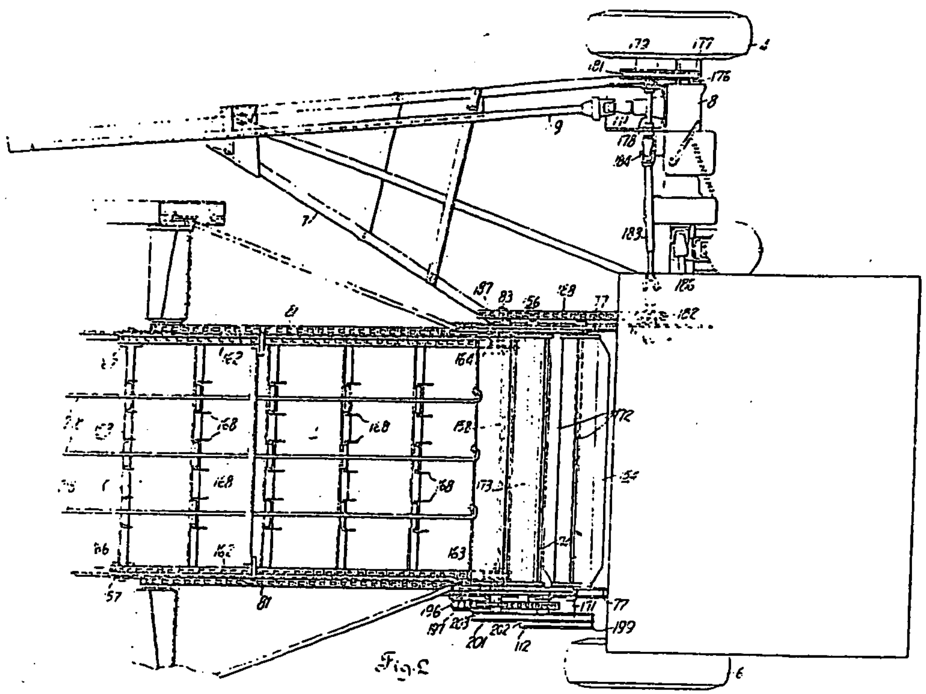

Fig. 2

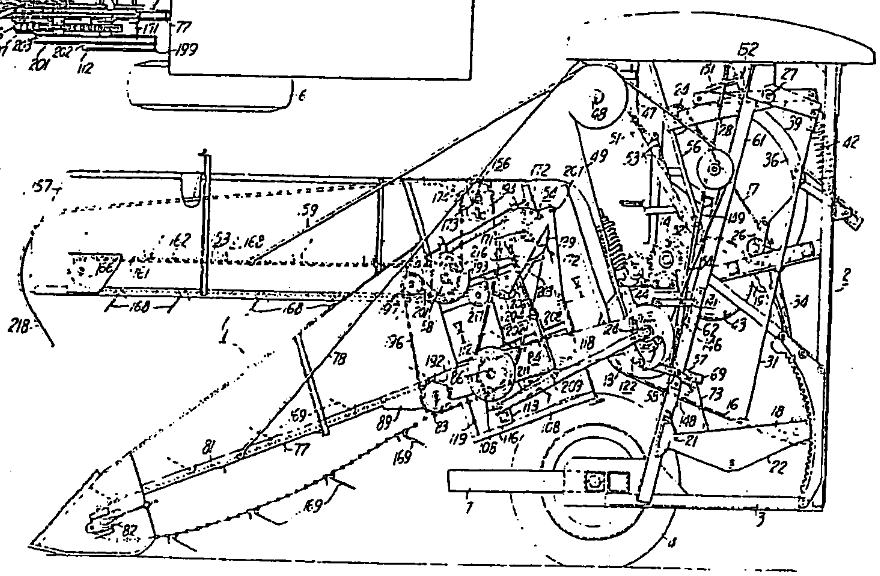

Fig. 1

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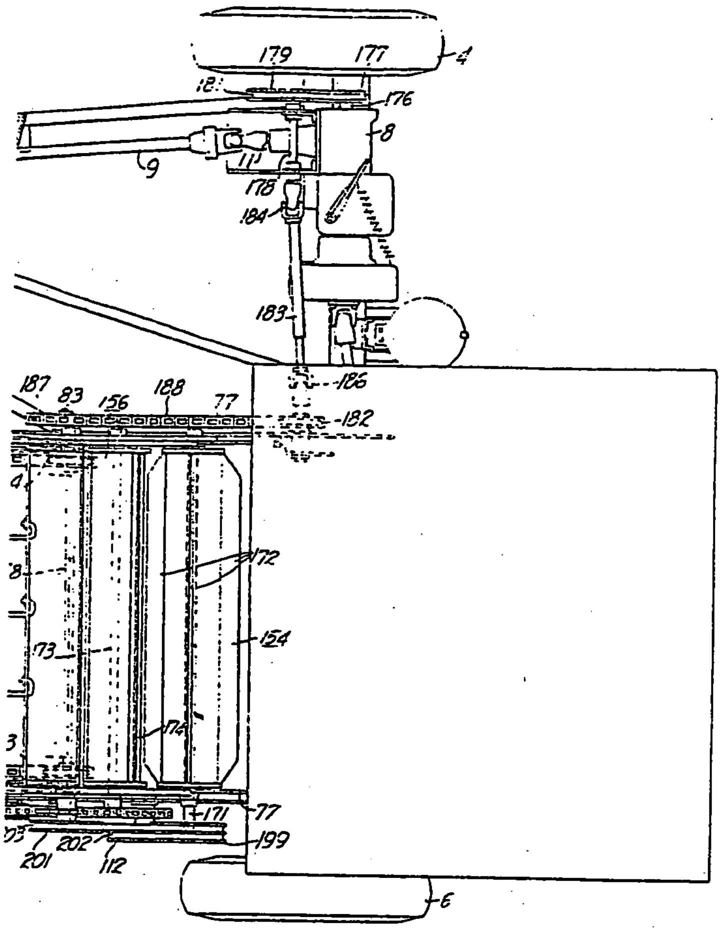
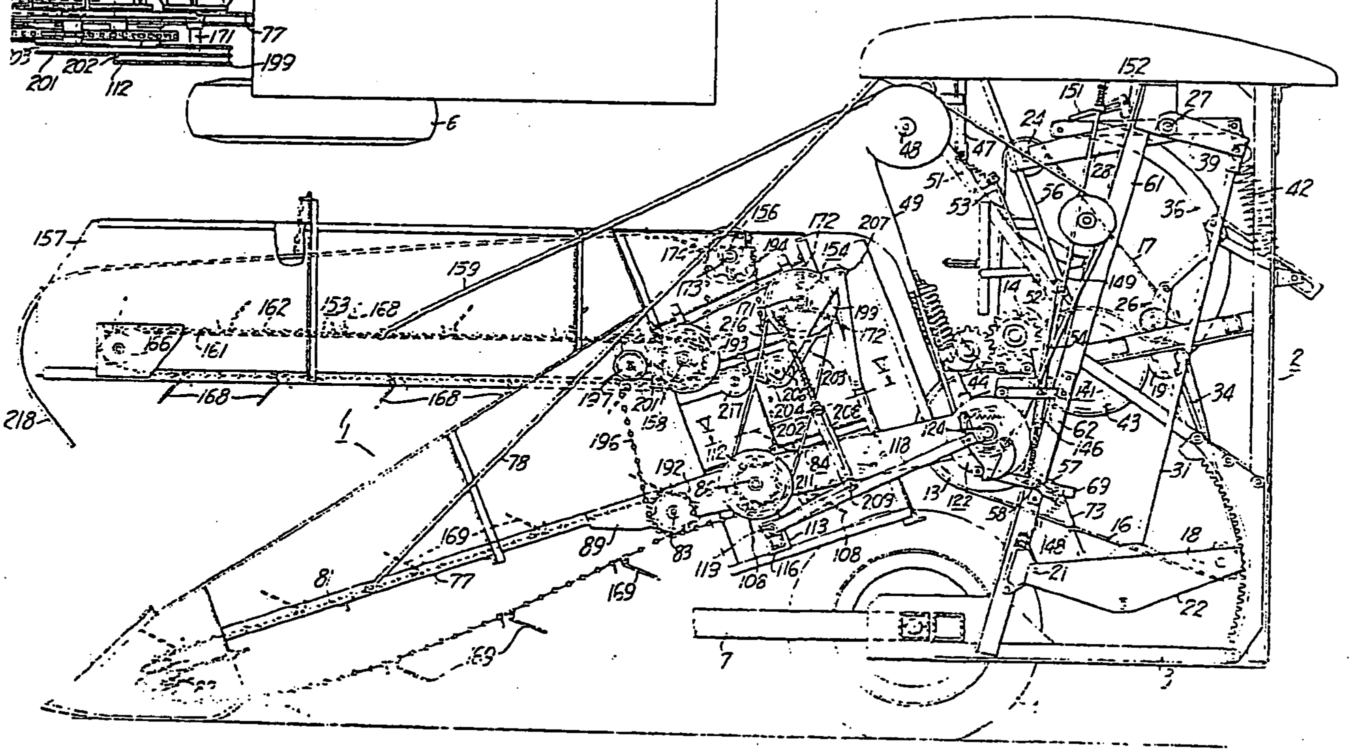



Fig.-1



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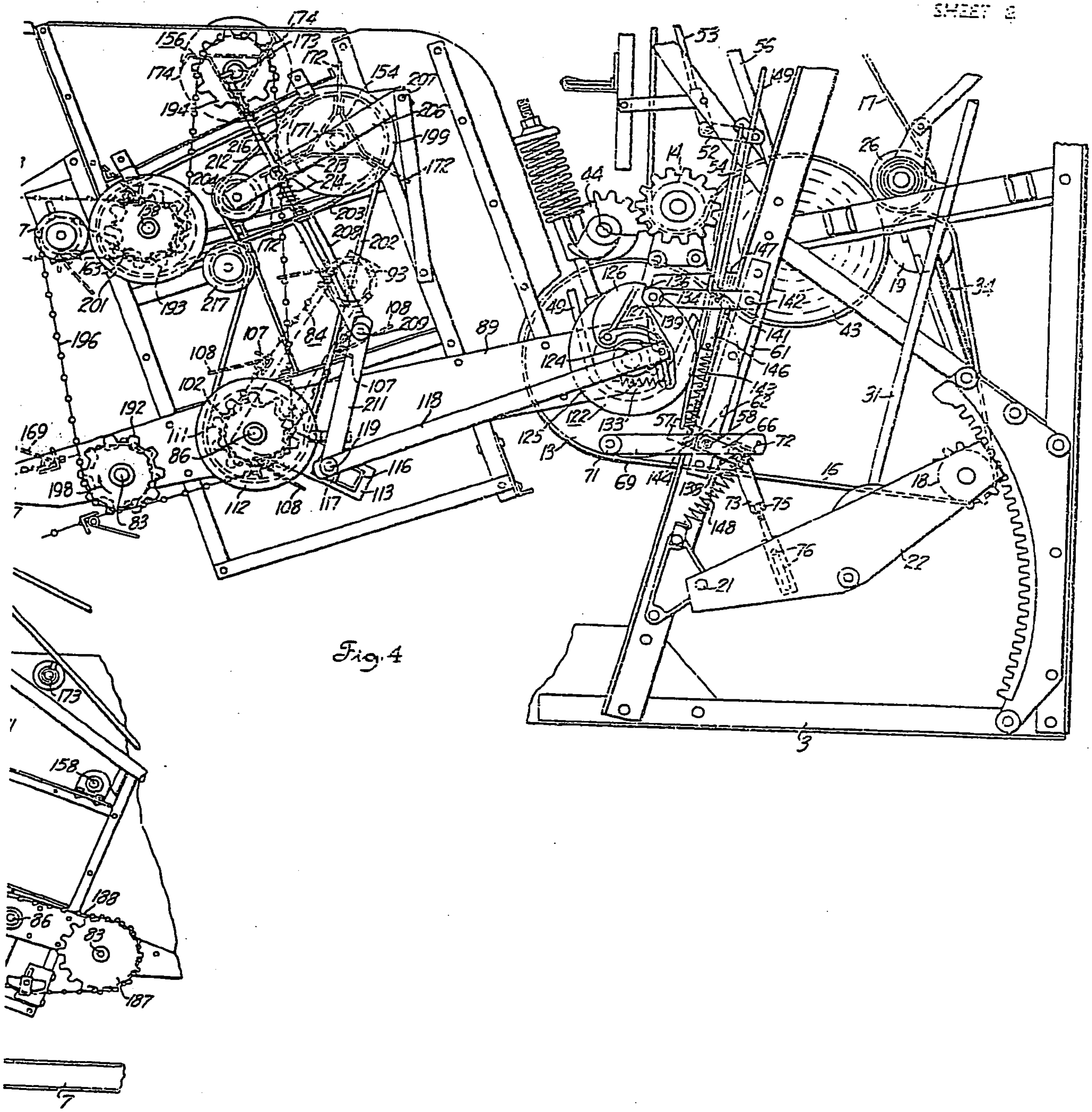
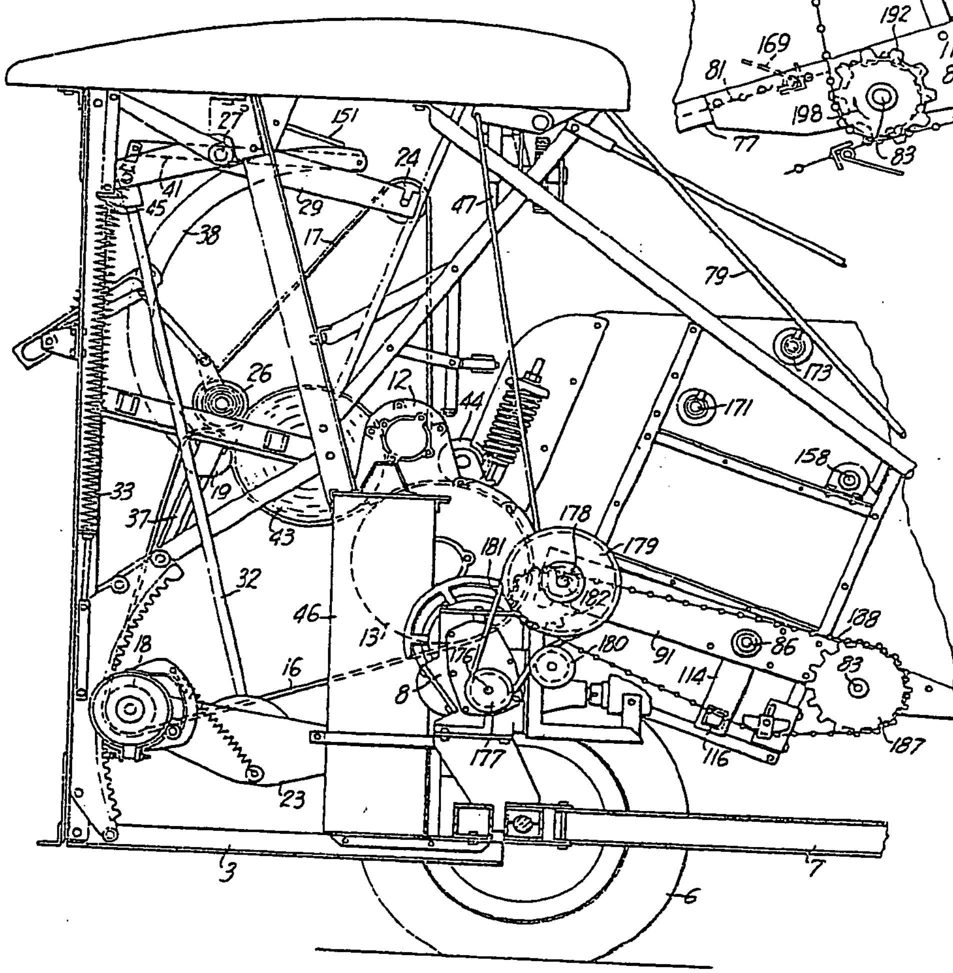


Fig. 4

Fig. 3



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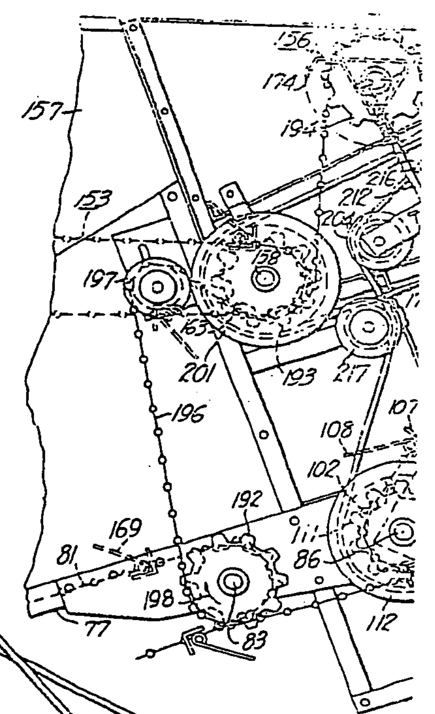

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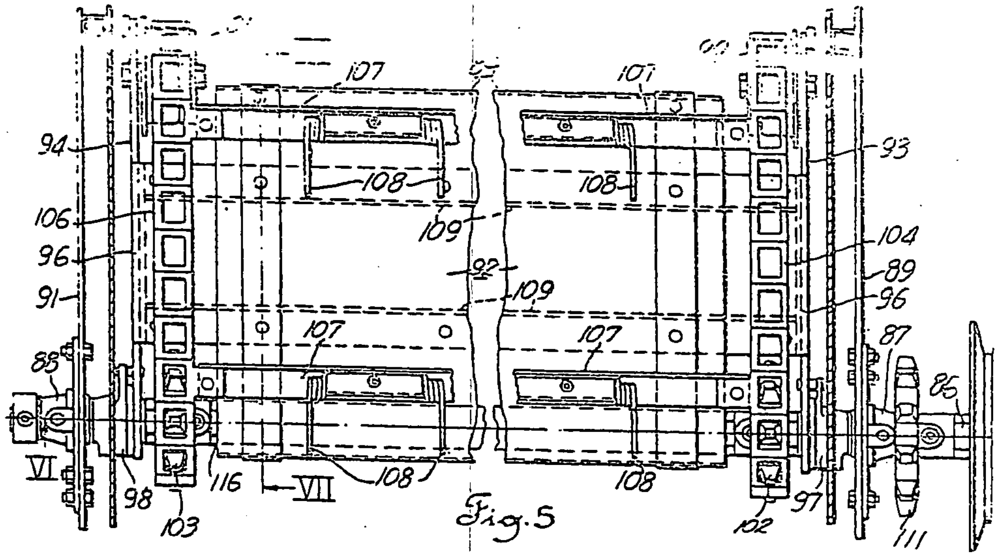



Fig.5

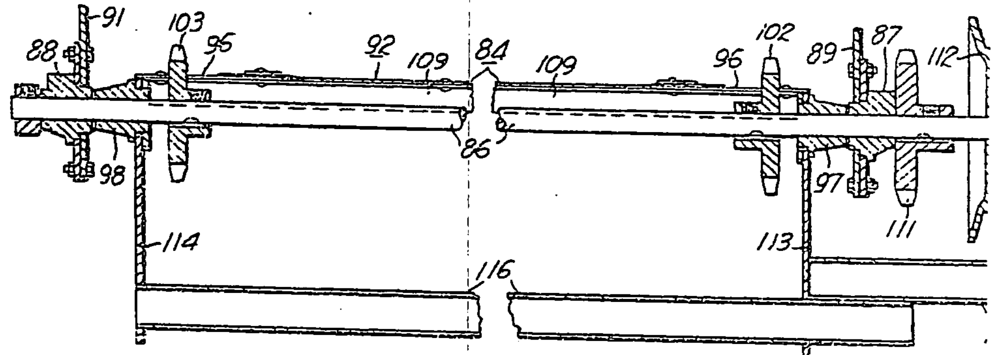
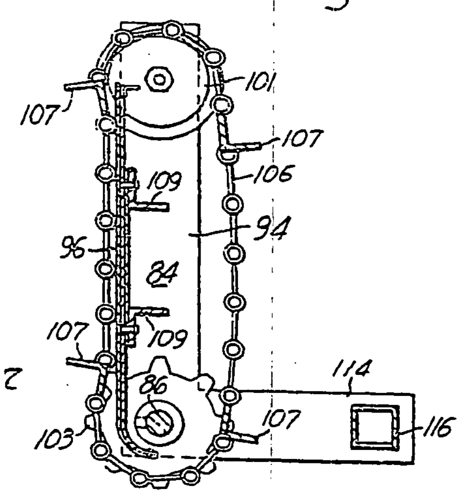
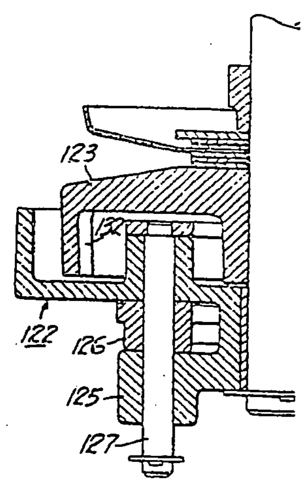



Fig.6

Fig.7



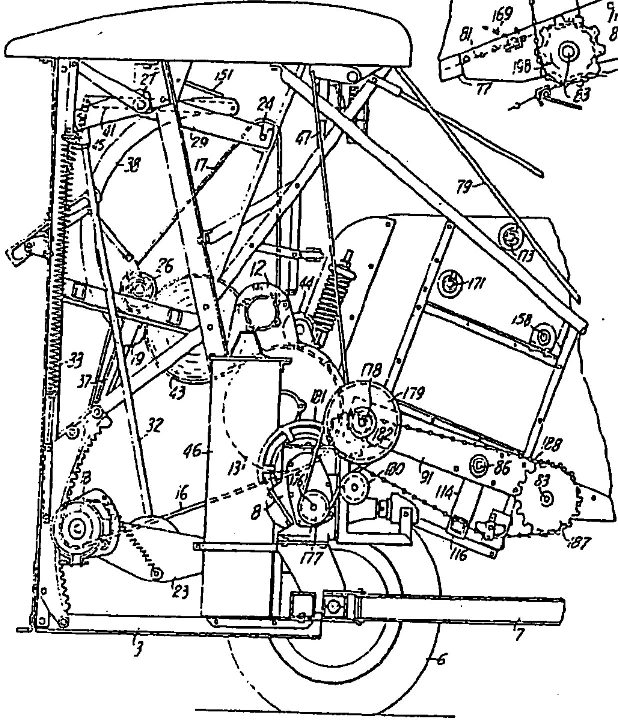


Fig. 3

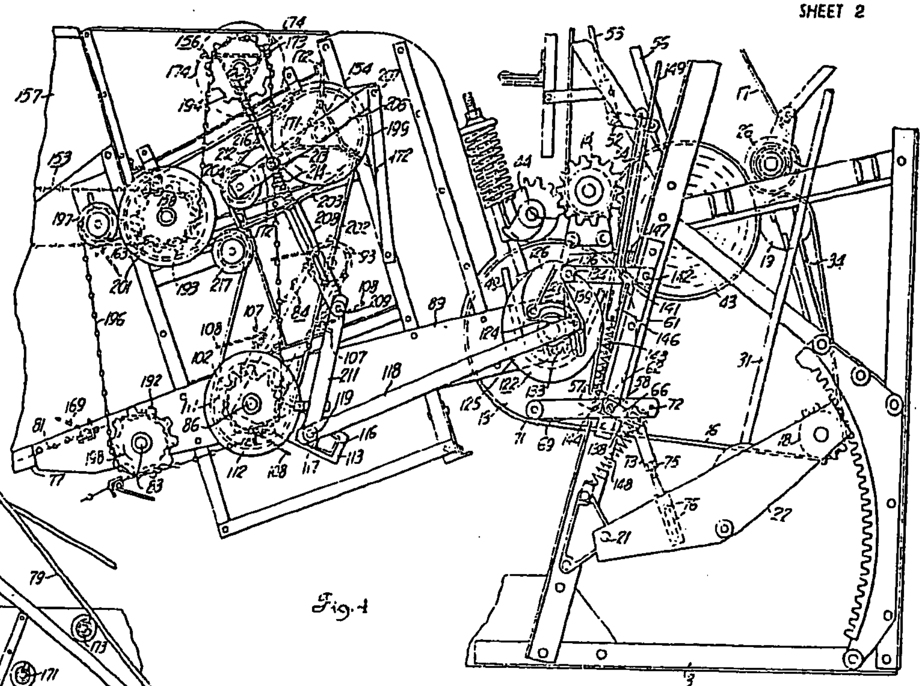


Fig. 4

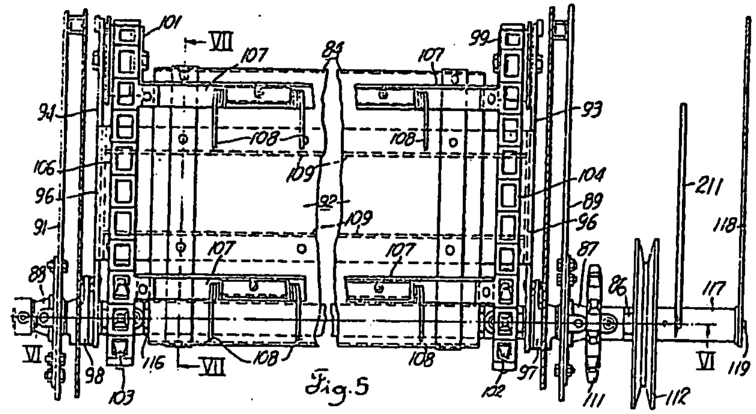


Fig.5

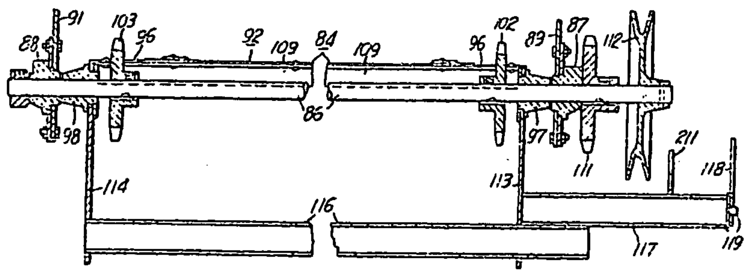


Fig.6

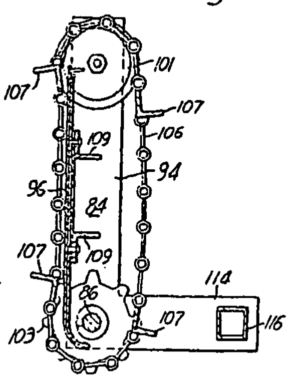


Fig.7

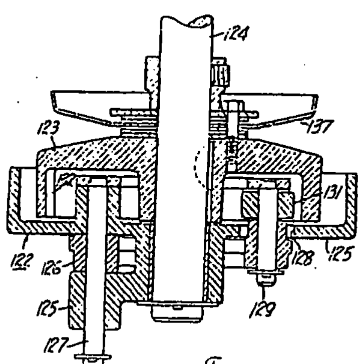


Fig.9

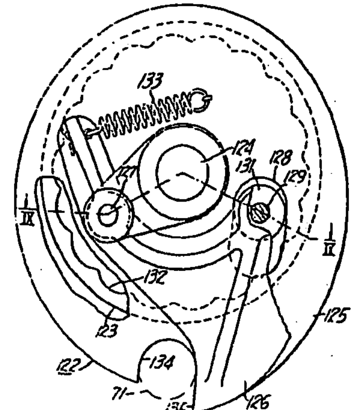


Fig.8

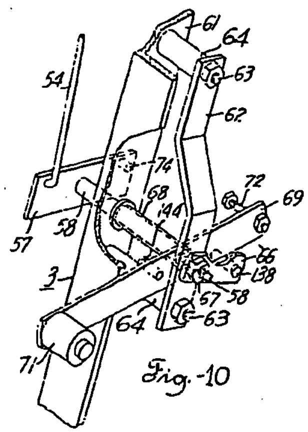
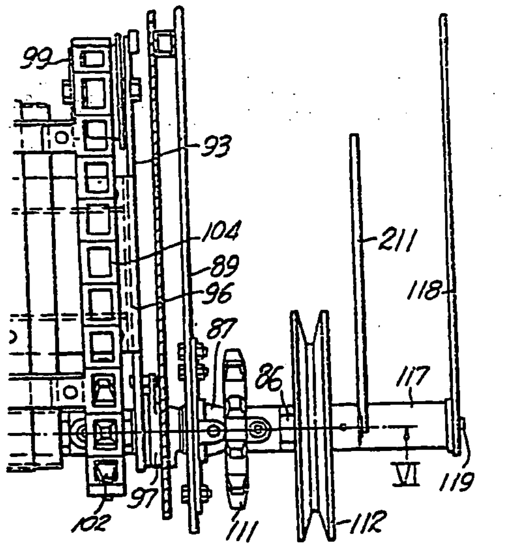
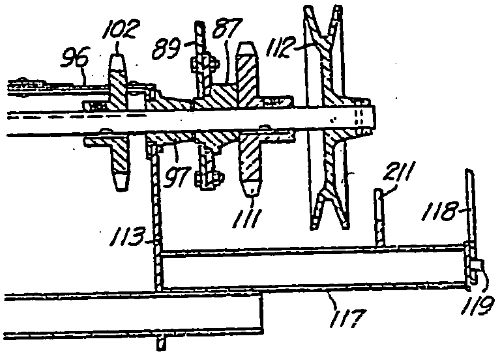


Fig.-10



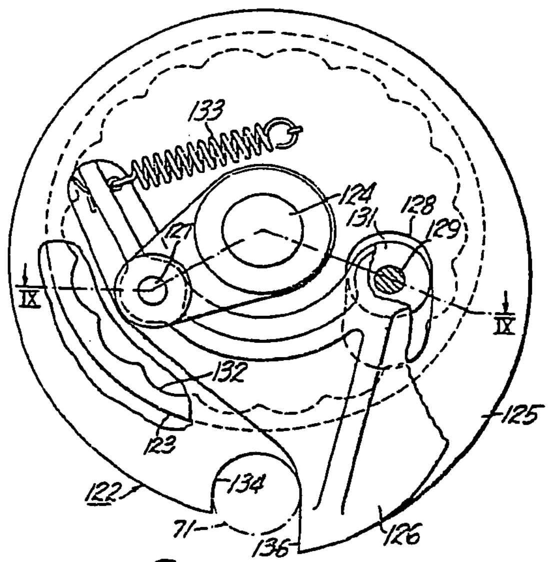




Fig. 8

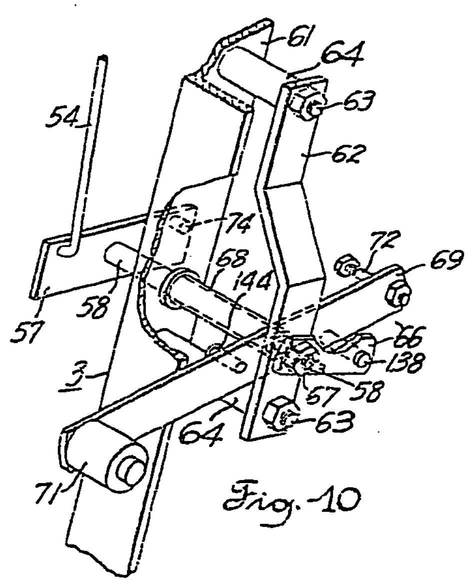



Fig. 10

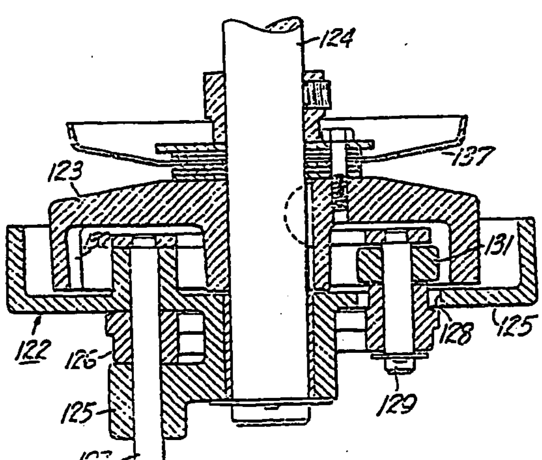



Fig. 9